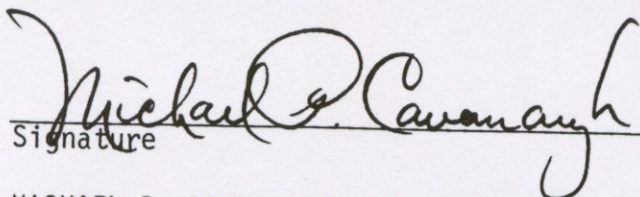


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U. S. Government Agency

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SUPER TYPHOON VANESSA

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Super Typhoon Vanessa, the most intense tropical cyclone of the 1984 season deepened to a near-record 879 mb. A brief review of Vanessa's life history is presented with emphasis on its rapid deepening and resultant eye characteristics.

1. Introduction

Of the approximately 31 tropical cyclones which develop in the western North Pacific each year, an average of four normally intensify to the 67 m/s necessary to be classified as "super typhoons." Typhoons of this magnitude usually support minimum sea-level pressures between 922 and 898 mb (Atkinson and Holliday, 1977).

During the 1984 season two cyclones attained "super typhoon" intensity with Super Typhoon Vanessa being the stronger of the two, reaching a peak intensity of 80 m/s. More significantly, Vanessa deepened to a minimum sea-level pressure of 879 mb. This is only 9 mb higher than the record 870 mb measured in Super Typhoon Tip in 1979 (Dunnayan and Diercks, 1980) and is the sixth lowest pressure ever recorded within a tropical cyclone.

2. Overview

Despite Vanessa's unusually strong intensity, it followed a very typical track for a late season typhoon (Fig. 1). Developing in the Near Equatorial Trough, Vanessa steadily intensified as it moved to the west-northwest passing 167 km south of the island of Guam as a 40 m/s typhoon. Vanessa continued to intensify in the Philippine Sea, a climatologically favorable area for intensification, reaching "super typhoon" status at 1800 GMT on 25 October. Vanessa's forward movement began to decrease as it neared the western periphery of the subtropical ridge. As Vanessa slowed in movement, it continued to

intensify reaching a peak intensity of 80 m/s at 1200 GMT on the 26th. After attaining its peak intensity Vanessa recurved to the northeast and weakened under the influence of a frontal system moving east from the Asian mainland. Vanessa transitioned into an extratropical storm-force low along the front, completing extratropical transition by 1200 GMT 30 October.

3. Maximum Intensity Phase

Figure 2 shows the time cross-section of Vanessa's minimum sea-level pressure as recorded by United States Air Force weather reconnaissance aircraft from the 54th Weather Reconnaissance Squadron, Andersen Air Force Base, Guam. A total of 19 reconnaissance missions were flown into Vanessa. During one twenty-seven hour period Vanessa's central pressure dropped a remarkable 75 mb. It was at the end of this very rapid pressure drop, at 2233 GMT 25 October, that the picture in Figure 3 was taken. At this time Vanessa possessed a 19 km eye. The typhoon is almost perfectly circular. Note the penetrative tops in the eyewall and the two sets of gravity waves in the deep convective collar. One set is concentric resembling tree rings while the other set is radial.

Less than one hour later, at 2318 GMT, aircraft reconnaissance into Vanessa reported an 892 mb surface pressure with an amazingly high 700 mb temperature of 31°C within the eye. The Aerial Reconnaissance Weather Officer in his post-mission report stated "a good fishbowl effect was evident in the eyewall....and the eyewall had a corkscrew appearance." Twelve hours later at 1114 GMT 26 October the next reconnaissance mission into Vanessa was conducted and on the plane's second fix of the typhoon measured the near record 879 mb sea-level pressure. The minimum height of the 700 mb surface was 2022 m which supports the reported pressure. The 700 mb temperature within the eye by this time had decreased slightly to 29°C. The Aerial Reconnaissance Weather Officer described the 19 km eye and eyewall as follows: "Excellent stadium effect and corkscrew on first fix. Corkscrew is defined as: individual thunderstorm cells in the

eyewall had a definite spiral from top to bottom due to shear above 700 mb. The 700 mb center was set close to the eyewall in the northwest quadrant. Frequent lightning and moderate turbulence in eyewall on both fixes. Cumulus banding inside the eye."

4. Concluding Remarks

The 879 mb reported in Super Typhoon Vanessa is the sixth lowest central pressure ever observed in a tropical cyclone. Fortunately Vanessa remained clear of land and only posed a threat to shipping. Table 1 contains a list of all Northern Hemisphere tropical cyclones on record which had a central pressure less than 880 mb.

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FIGURE LEGENDS

Fig. 1. Best track for Super Typhoon Vanessa.

Fig. 2. Time/pressure trace for Super Typhoon Vanessa. The pressure values were determined from reconnaissance dropsonde data or from extrapolation from the 457 m flight-level. The complete aircraft, satellite and radar fix data on Vanessa can be found in the 1984 Annual Tropical Cyclone Report published by the Joint Typhoon Warning Center, Guam.

Fig. 3. Defense Meteorological Satellite Program imagery of Super Typhoon Vanessa taken at 2233 GMT 25 October 1984.

Table 1. Tropical cyclones with central pressures less than 880 mb.